

STUDY GUIDE

Aerospace: The Flight of Discovery Chapter 4

Definitions, People, and Principles

1. A **satellite** is a man-made object or vehicle that orbits the Earth.
2. **Newton's third law of motion** states that for every action, there is an equal and opposite reaction.
3. The **airframe system** of a rocket contains the other major rocket systems and provides the shape of the rocket. The other rocket systems contained in the airframe are the **propulsion system, guidance system, and control system**.
4. The path described by one body in its revolution about another body is called an **orbit**.
5. A **sunsynchronous orbit** is a polar orbit that keeps a satellite exposed to constant sunlight. A **geostationary orbit** is an orbit that keeps a satellite directly above a fixed point on the Earth.
6. A **space probe** is a spacecraft that, either flies by, orbits or lands on a celestial body other than Earth.
7. A **circular orbit** maintains a constant altitude above the Earth's surface.
8. **Search and Rescue Satellites** (SARSATs) detect and locate emergency locator transmitter (ELT) signals, helping to locate people in distress.
9. **Robert Goddard** designed, built, and launched the first liquid-propelled rockets and was known as the "Father of Modern Rocketry."
10. One of the services provided by environmental satellites is providing weather information to help meteorologists with weather forecasts.
11. The three major parts of the space shuttle are the orbiter, solid rocket boosters, and the external fuel tank. All of these components are recovered for reuse except the external fuel tank.
12. Galileo proved that objects of different weights will fall at the same rate of speed. That is, two objects of different weights that are simultaneously dropped from the same height will strike the ground at the same time.
13. The Chinese developed the first practical military rockets over 600 years ago.
14. **Newton's first law of motion** states that a body at rest remains at rest and body in motion tends to remain in motion unless acted upon by an outside force.

***Aerospace: The Flight of Discovery* Chapter 4**

15. One way to increase thrust of a rocket is to accelerate the exhaust particles to a higher velocity by directing them through a nozzle. The nozzle reduces the cross-sectional area of the exhaust flow forcing it to speed up.
16. Another way to increase thrust is to increase the fuel burn rate. In a solid fuel rocket, this is done by increasing the surface area of the fuel where burning takes place. In a liquid fuel rocket this is done by feeding fuel into the combustion chamber at a higher rate.
17. Satellites in an equatorial orbit at a distance where the satellite's period of revolution is the same as the Earth's period of rotation are called **geostationary** satellites. When a satellite is in a geostationary orbit, it will remain over the same spot on the Earth's surface.
18. **Neil Armstrong** was the first human to walk on the moon.
19. According to the CAP textbook, **solar cells** or **photovoltaic cells** are the most popular method of generating electricity for spacecraft.
20. Many products have come from aerospace technology. For example, materials developed for space flight are now used for everyday civilian uses. Such products are called **spin-offs** of space technology.
21. The two major categories of satellites are applications and scientific satellites.
22. The **propulsion system** of a rocket consists of everything directly associated with propelling a rocket.
23. The **apogee** is the point at which a satellite in orbit around the Earth is farthest from the Earth. The **perigee** is the point at which it is the closest to the Earth.

Spacecraft

24. **Project Mercury** was the first U.S. manned space program that tested human survival in space and resulted in man orbiting the Earth. **Project Gemini** followed Mercury and helped the U.S. gain experience in space walking and docking spacecraft. **Project Apollo** came next and resulted in landing men on the moon and returning them safely to Earth.
25. **Apollo-Soyuz** was a manned space flight program that involved the linkup in space of American and Soviet manned spacecraft.
26. **Telstar 1** was the first active satellite that amplified and retransmitted as many as 60 two-way telephone conversations at one time. **Echo 1** was a passive satellite launched before Telstar and was essentially a large metallic coated balloon that reflected radio signals back to earth.

***Aerospace: The Flight of Discovery* Chapter 4**

27. Because the **Hubble Space Telescope** operates over 300 miles above the Earth, it not affected by atmospheric interference that plagues telescopes on the Earth. This allows astronomers to see objects in space much more clearly than from Earth.
28. **Project Mercury** was America's first manned space flight program and answered the question about human survival in space.
29. The **Explorer** satellite series was the first and oldest launched by the United States.
30. **Ranger** and **Surveyor** were the names of the two projects that probed the moon and sent information back to Earth to prepare for the Apollo moon landing.
31. **Project Gemini** was the U.S. space project that was responsible for the first walk in space.
32. **Syncom**, **Telstar**, and **Westar** are all communications satellites.
33. **Project Skylab** proved that people could live and work in space for periods of at least three months with no ill effects.
34. The **Viking** satellite series had the mission of analyzing the atmosphere of Mars, photographing the planet's surface and searching for life.
35. The **Ranger** space probes were the first used to investigate the moon. They took and sent back pictures to the Earth of the moon as the spacecraft approached on a collision course.
36. The series of **Surveyor** probes landed on the moon during the period 1964-1968. These were *soft landers* in that they carried retrorockets, which slowed them sufficiently to land undamaged.
37. During 1966-1967, five **Lunar Orbiters** were launched to the moon and provided high quality photographs of the moon's entire surface.
38. The **Mariner** probes were used to investigate the inner planets (Mercury and Venus) during the period 1962-1973.
39. The **Pioneer** spacecraft probed both the inner and outer planets. Pioneer 10 gave us the first close-up pictures of Jupiter in 1973. Pioneer 11 was the second probe of Jupiter. In addition, it flew past Jupiter in 1974 and began a trajectory to Saturn, sending back the first pictures and data from Saturn in 1979.
40. The **Voyager** probes gave us greatly improved pictures and data from Jupiter and Saturn in 1979 and 1980.
41. The spacecraft **Galileo** will orbit and probe Jupiter sometime in the mid-1990s.